

Committee III: Techniques for Thyroid FNA

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- Greg Randolph, Surgeon

Techniques: Agenda Items

- A. Aspiration devices, needles and methods for thyroid FNA.
- B. Role and guidelines of anesthesia for FNA of palpable and nonpalpable nodules of the thyroid
- C. Influence of nodule location, size and imaging characteristics on FNA technique
- D. Role of ultrasound guidance for FNA of palpable thyroid nodules
- E. Utility of core needle biopsy for palpable and nonpalpable thyroid nodules.
- F. Advantages and disadvantages to various specialists performing FNA of palpable thyroid nodules
- G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment.
- H. Guidelines for management of adverse reactions during and after thyroid FNA.
- I. Optimal number of biopsy passes for solid and cystic nodules.
- J. Sample adequacy for solid and cystic thyroid nodules.

Presentation Format

- A. Aspiration devices, needles and methods
- B. The role of anesthesia for palpable and nonpalpable FNA and guidelines for its use

Presented by Dr. John Abele,
Cytopathologist, UCSF, Outpatient Pathology
Associates, Sacramento, CA

Presentation Format

- C. Influence of nodule location, size and imaging characteristics on FNA technique
- D. Role of ultrasound guidance for FNA of palpable thyroid nodules
- E. Utility of core needle biopsy for palpable and nonpalpable thyroid nodules.
- F. Advantages and disadvantages to various specialists performing FNA of palpable thyroid nodules

Presented by Dr. Dan Duick
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Presentation Format

- H. Guidelines for management of adverse reactions during and after thyroid FNA.

Presented by Dr. Greg Randolph
Surgeon, Massachusetts General Hospital

Presentation Format

- G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment.
- I. Optimal number of biopsy passes for solid and cystic nodules.
- J. Sample adequacy for solid and cystic thyroid nodules

Presented by Dr. Martha Pitman

Pathologist, Massachusetts General Hospital

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Review**

- For aspirations performed by cytopathologists, pathologists, or clinicians with immediate access to cytopathology laboratory the following is recommended:
 - Solid and semi-solid material
 - Air-dried and alcohol fixed smears should be prepared for Romanowsky (Diff Quik, Wright- Geimsa, Wright stains) and Papanicolaou staining, respectively.
 - Needle rinses and/or dedicated pass for cellblock preparation if needed.
 - Cyst fluid
 - One or two air-dried smears (immediate interpretation)
 - Cytospins or liquid based (Surepath, ThinPrep) preparations
 - Cellblock if cyst fluid clots or contains minute fragments of tissue

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Review**

- For aspirations performed by clinicians without immediate access to the cytopathology laboratory, the following is recommended for both solid/semi-solid and cystic specimens:
 - Collection of material in liquid preservative as directed; Examples
 - RPMI, saline (cytospins)
 - Formalin (cellblock)
 - Liquid based collection vials (Surepath, ThinPrep)

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Review**

- **Optimal routine preparation of aspiration material for ancillary studies**
 - Immunocytochemistry
 - Cell block- formalin fixed (optimal)
 - Dedicated pass(es)
 - Needle rinsings
 - LBC preparations, cytopins and direct smears
 - Requires appropriate controls

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Review**

- **Optimal routine preparation of aspiration material for ancillary studies**
 - Flow Cytometry
 - Needle rinsings from dedicated pass(es)-optimal
 - RPMI
 - Balanced saline

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Review**

■ The role of immediate assessment

- *Decrease complications*
- *Determine specimen adequacy*
- *Triage of the specimen*
- *Triage of the patient*

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Controversies**

- Liquid based preparations

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Controversies**

■ Liquid based preparations

■ Opponents

- Studies on accuracy of LBC few compared to direct smears; many studies not supportive of LBC
- teach better smearing methods rather than resorting to LBC as a “rescue” method
- Many community pathologists cannot interpret LBC accurately and patients are being harmed

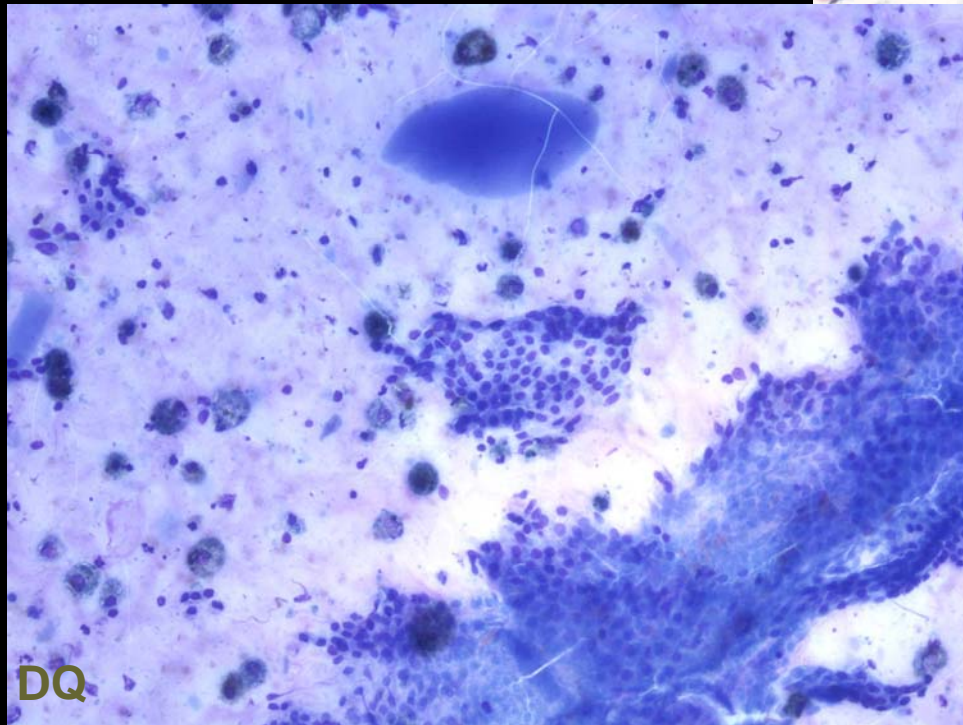
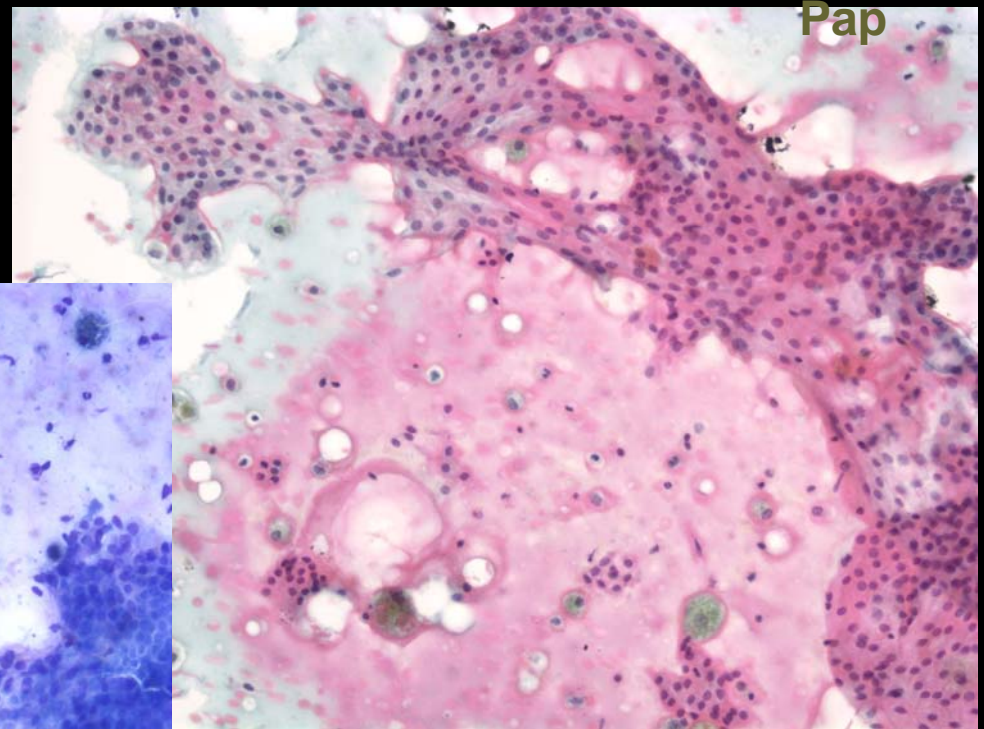
■ Proponents

- teach pathologists nuances of cytological features on LBC
- Accuracy is as good when interpreted by experienced pathologists, supported by literature
- Use LBC and gain experience

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Controversies**

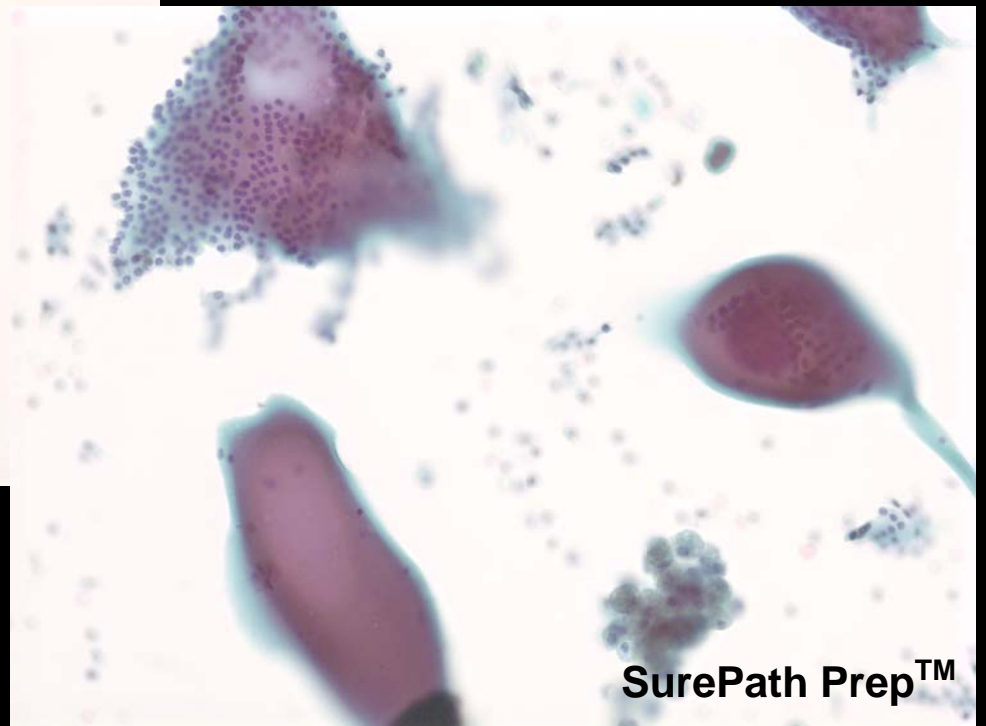
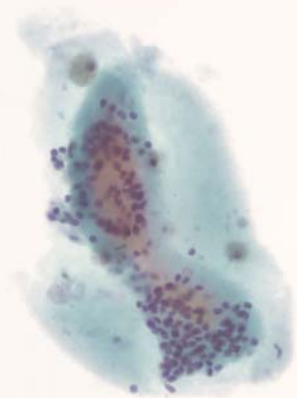
- Liquid based preparations
 - Points to consider:
 - Quality specimens are usually diagnostic regardless of preparation method

Benign Nodule: direct smears thick colloid and benign follicle cells



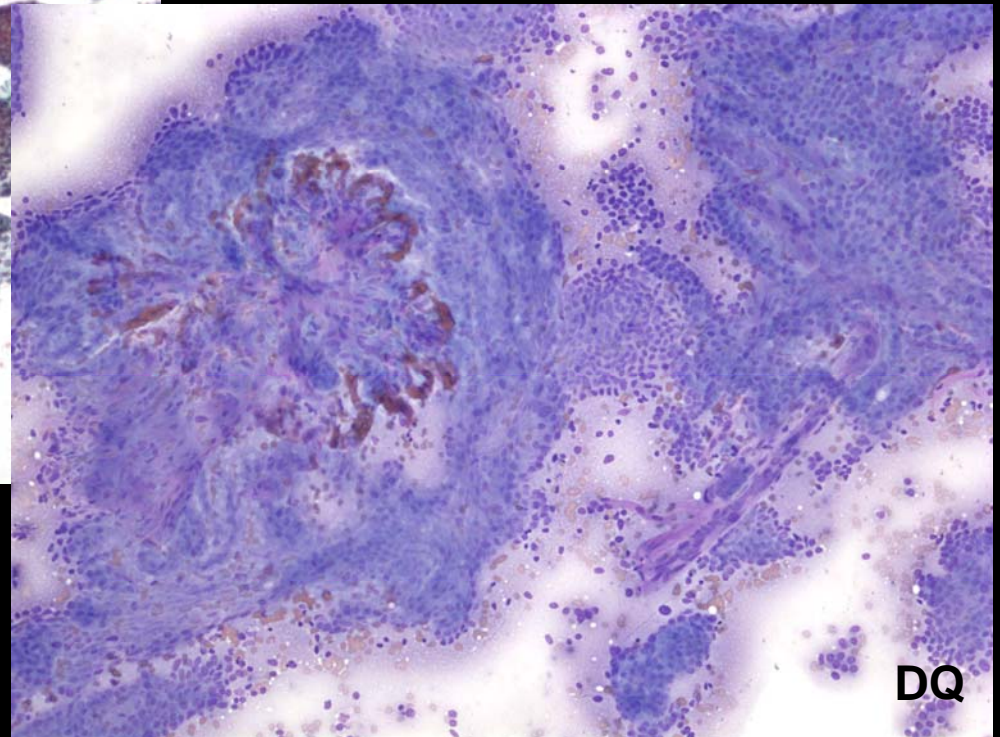
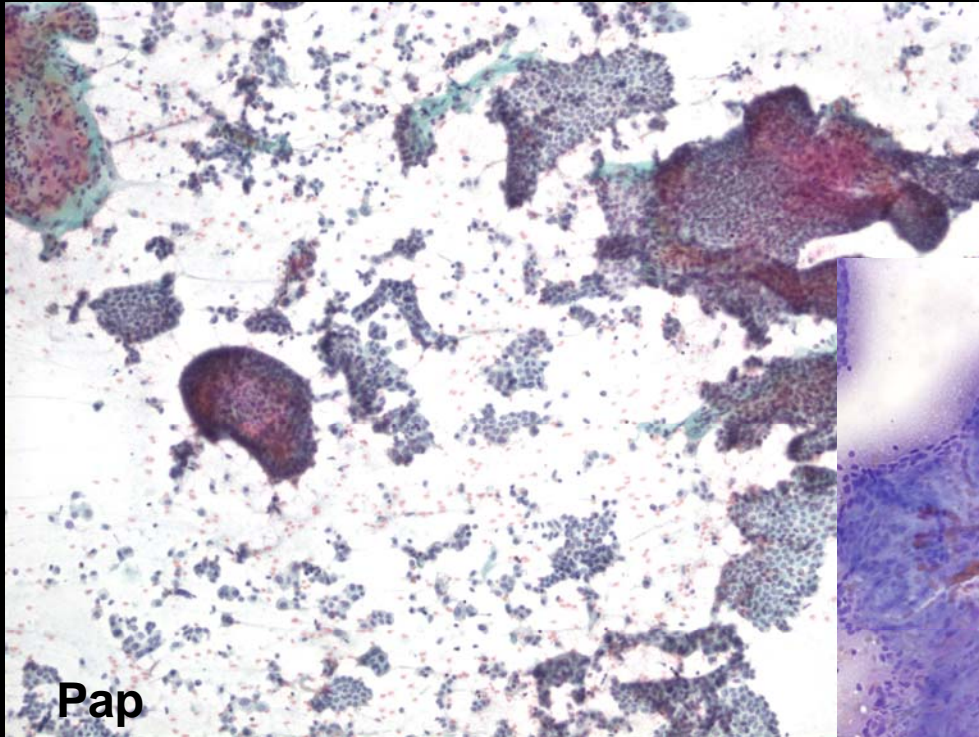
Benign Nodule: LBC colloid and benign epithelium

ThinPrep®

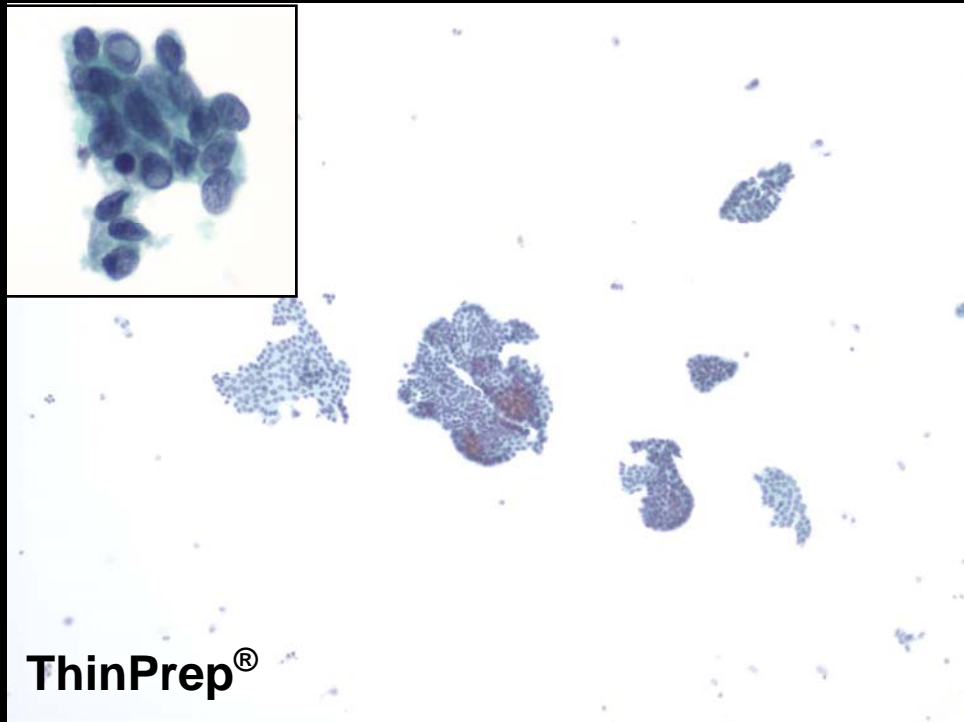


SurePath Prep™

Papillary Carcinoma: direct smears



Papillary Carcinoma: LBC

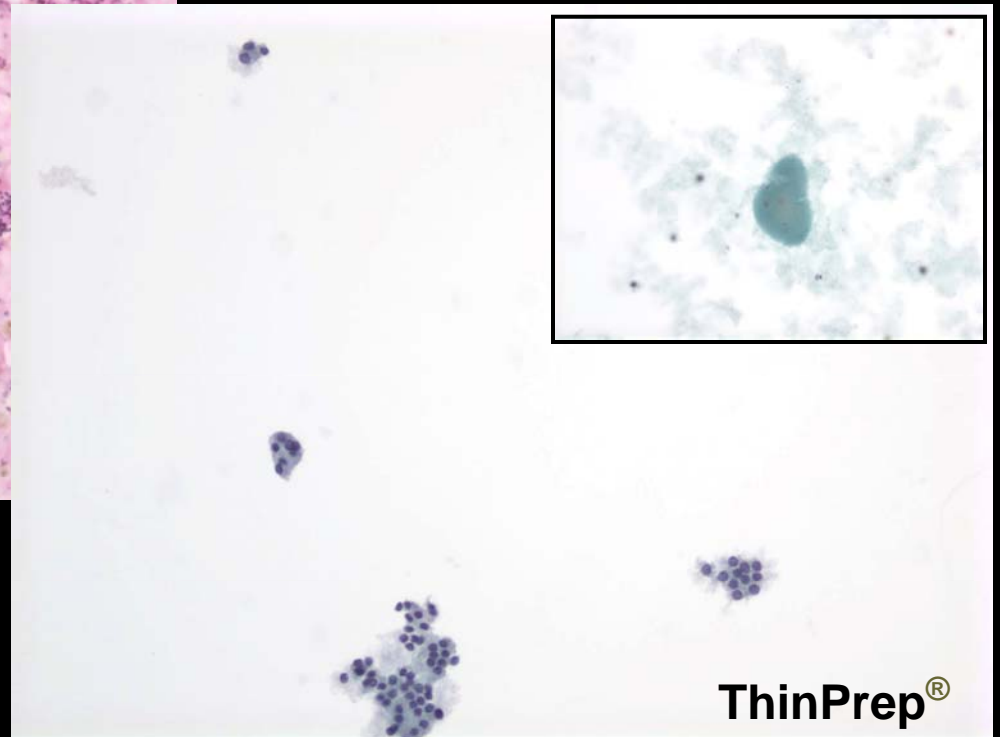
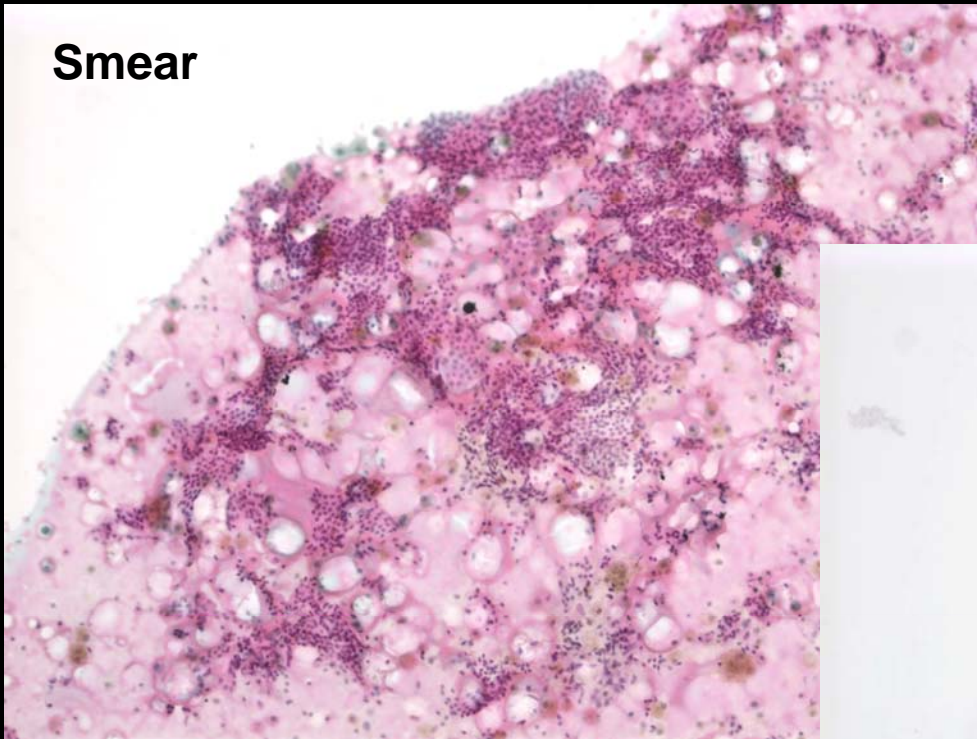


G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Controversies**

- Liquid based preparations
 - Points to consider:
 - LBC does modify architectural and cytological features to some degree that create diagnostic challenges

Altered Architectural Integrity: LBC

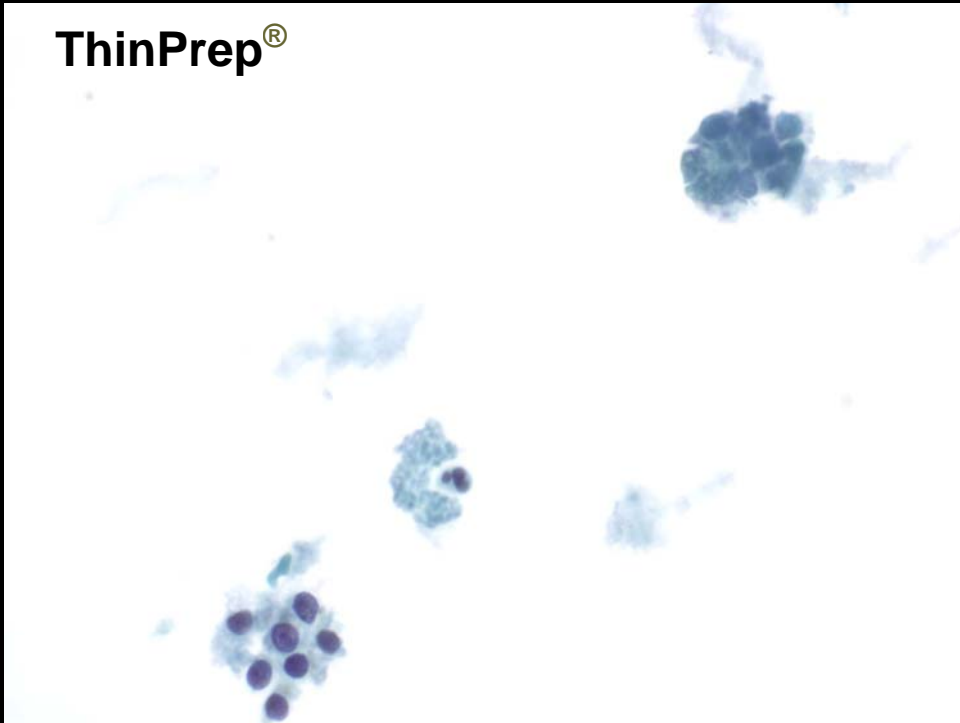
Smear



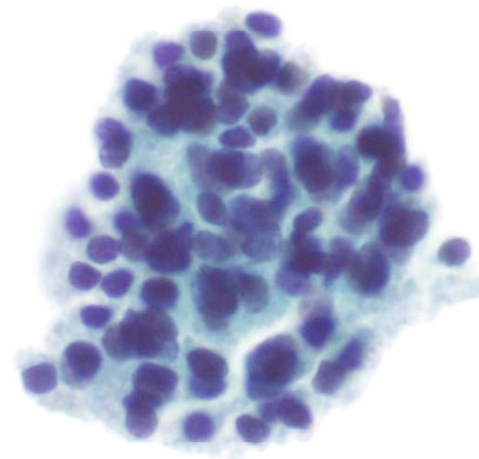
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Altered Architectural Integrity

ThinPrep®



**Fragmentation and
artificial crowding of
macrofollicular
sheets**

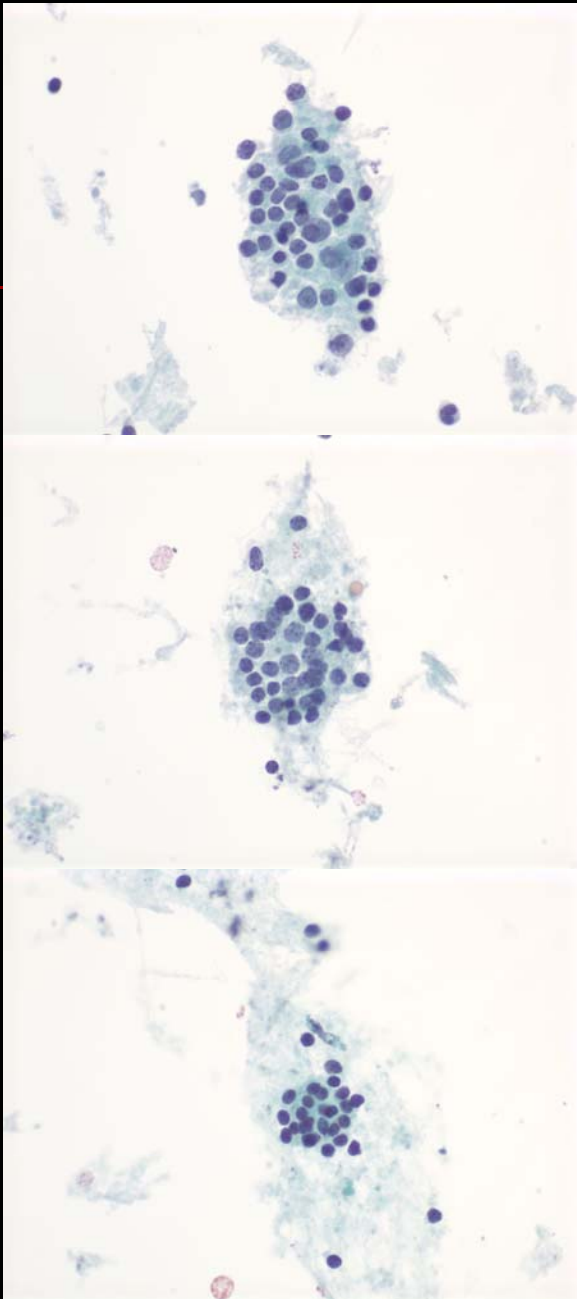


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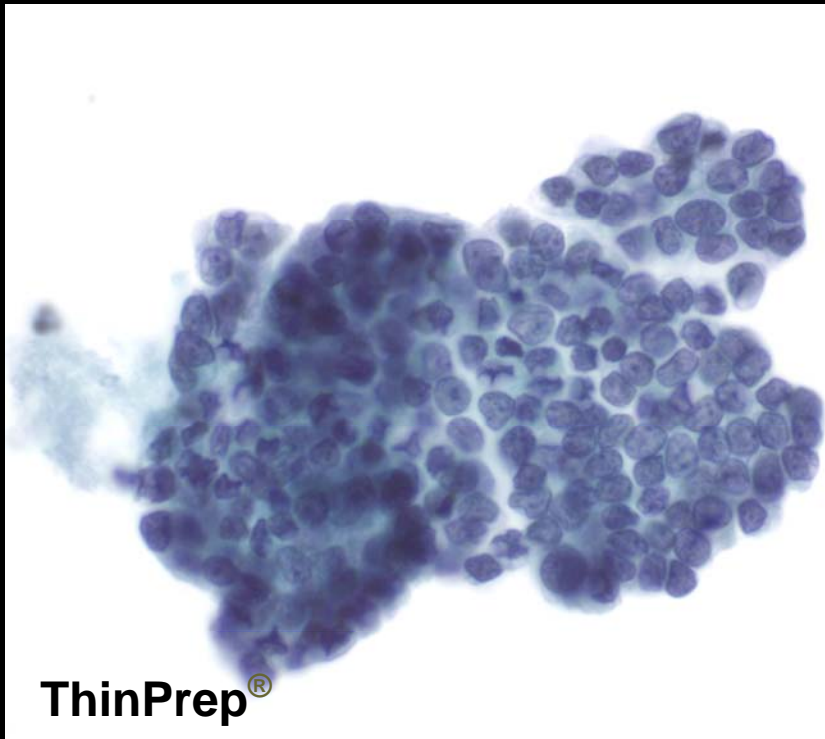
Altered Architectural Integrity

Hashimoto's Thyroiditis

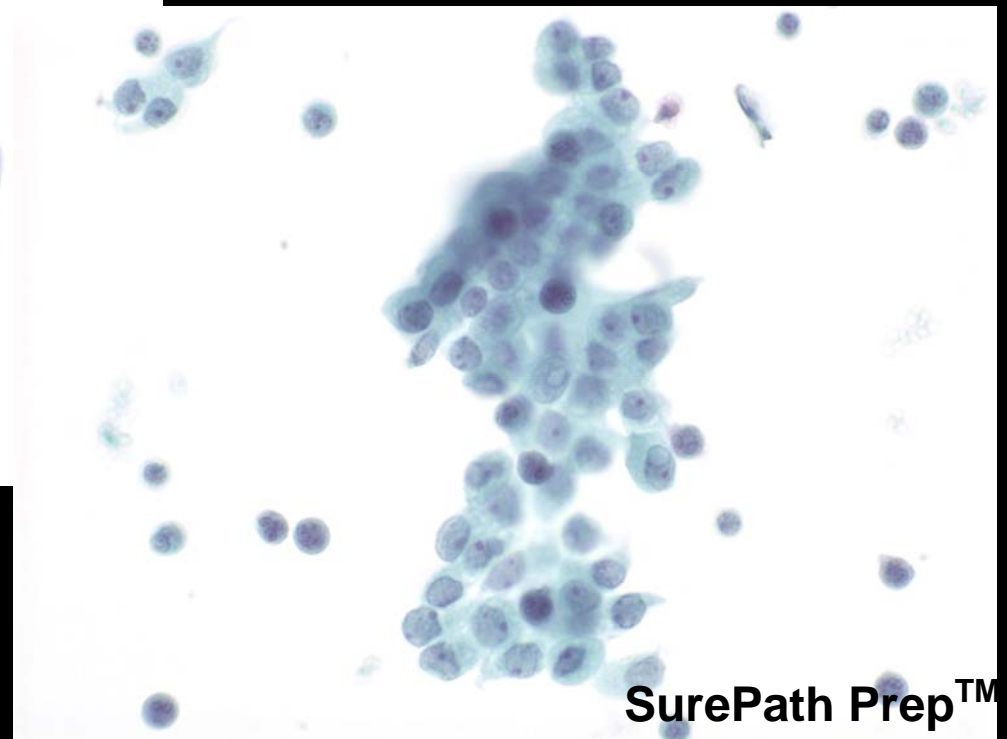
**Cell clusters can be difficult to distinguish- ? Type
Follicular versus lymphoid
Macro versus Micro**



Altered Cellular Morphology: Papillary carcinoma



decreased prominence of
nuclear grooves and
pseudoinclusions in papillary
carcinoma



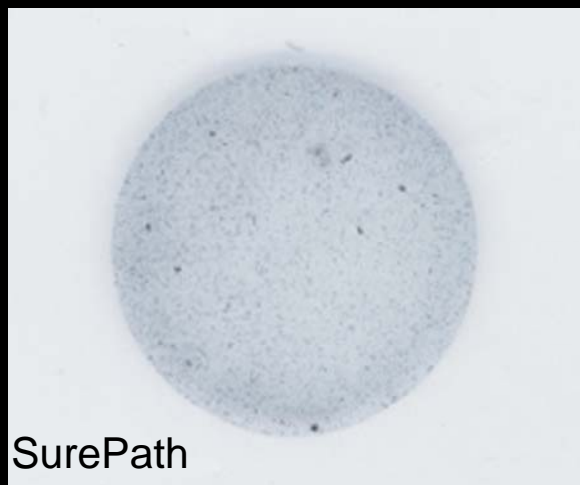
G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Controversies**

- Liquid based preparations
 - Points to consider:
 - A “less than classic” example of any entity is a challenge regardless of the method of processing

Until everyone makes great smears: You choose



ThinPrep



SurePath



Photo Credit: WJ Frable via Dr. Abele

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment: **Conclusions**

■ Optimal Routine Preparation:

1. Preparation of material by experienced personnel

Solid and semi-solid material

Air-dried and alcohol fixed smears should be prepared for Romanowsky (Diff Quik, Wright- Geimsa, Wright stains) and Papanicolaou staining, respectively.

Needle rinses and/or dedicated pass for cellblock preparation if needed.

Cyst fluid

One or two air-dried smears (immediate interpretation)

Cytospins or **liquid based** (Surepath, ThinPrep) preparations

Cellblock if cyst fluid clots or contains minute fragments of tissue

2. Preparation of material by inexperienced personnel or from remote sites

Collection of material in liquid preservative as directed

RPMI, balanced saline (cytospins)

Formalin (cellblock)

Liquid base collection vials (Surepath, ThinPrep)

3. Optimal Tissue Preparation for Ancillary Studies

Flow Cytometry

RPMI or balanced saline for flow cytometry or cytospins for immunocytochemistry

Immunocytochemistry

Formalin fixed cell button for cell block

4. Immediate Assessment is recommended if at all practical, as it

Decreases complications

Determines specimen adequacy

Improves triage of tissue

Enhances triage of patient care

G. Optimal preparation of FNA material for routine evaluation and ancillary studies, and the role of immediate assessment

Discussion:

On relative merits of the LBC as a processing method in general and whether LBC can be included in this draft as an alternative to smears.....

I. Optimal number of passes for a solid and cystic lesion: **Review**

- The optimal number of passes is directly related to obtaining an adequate specimen (discussed next, Agenda Item J)

Factors that can affect adequacy rates

- 1. Operator's skill
- 2. Nature of the nodule (size, location, cystic, fibrotic, etc)
- 3. Gauge of the needle
- 4. Whether the needle is aspirated or only capillary suction is used
- 5. The number of passes
- 6. Other technical factors
- 7. The criteria for adequacy
- 8. The patient's tolerance of the procedure

I. Optimal number of passes for a solid and cystic lesion: **Review**

- The goal of an adequate specimen is to ensure that the sensitivity of the aspirate is sufficiently high to allow clinical follow-up of negative aspirates without the need for additional tissue sampling.
- 22 studies show that 97-100% adequacy can be achieved with 7-8 passes, although all studies showed that adequacy increased with the number of passes and some studies went up to 11 and 12 passes
- The optimal number of passes should be the same for solid and cystic lesions

I. Optimal number of passes for a solid and cystic lesion: **Controversies**

- 4. A reasonable guideline is as follows:
 - FNAs without a rapid interpretation available: 2-8 biopsies
 - Given that data showed close to 100% adequacy with 7 passes, recommendation made to change 8 to 7 and add “but not more than 11”
 - remaining tissue rinsed into a collection tube with transport fluid without fixative. This residual fluid can be saved until an initial evaluation of the cytology assists in proper tissue triage.
 - Recommendation made that all tissue be processed for cytological analysis and that additional tissue can be obtained for ancillary studies if need be. This recommendation also supports a similar statement made in by Committee V on Ancillary Techniques (page 92).

I. Optimal number of passes for a solid and cystic lesion: **Conclusions**

- 1. It is not possible to define a specific number of passes that should be used in every setting. Based on the information in the literature, up to 12 passes may be of value when immediate adequacy assessment is available.
- 2. If immediate adequacy assessment is not available, between 2 and 8 passes are a reasonable number of passes to perform to try and ensure an adequate sample.
- 3. There is no justification to recommend a different number of passes for a cystic lesion, unless the criteria for adequacy are different.

I. Optimal number of passes for a solid and cystic lesion: **Conclusions**

- 4. A reasonable guideline is as follows:
 - FNAs with rapid interpretation available: 2 biopsies from different areas of the lesion with a representative slide stained for adequacy. No more tissue is needed if 1. a cyst is completely drained and no residual mass is identified, 2. a specific malignancy is identified (and no ancillary tests are deemed necessary), or 3. if the aspirate appears adequate. Additional biopsies are recommended if 1. there is a residual mass after draining a cyst, 2. cellularity is inadequate or, 3. to enrich a sample for cellblock, flow cytometry or electron microscopy.
 - FNAs without a rapid interpretation available: 2-8 biopsies from different sites with representative tissue from each pass smeared on a slide (or 2) and the remaining rinsed into a collection tube with transport fluid without fixative. This residual fluid can be saved until an initial evaluation of the cytology assists in proper tissue triage.

I. Optimal number of passes for a solid and cystic lesion

Discussion

J. Adequate FNA samples from a solid and cystic thyroid lesion: **Review**

- Given that the purpose of thyroid FNA is to provide clinically useful information regarding the need for surgery, the FNA sample must be adequate enough for interpretation that yields a low false negative rate.
- Adequacy defines the quality and quantity of a sample
 - An FNA specimen must be of good quality and “technically” adequate for interpretation. The FNA sample must be well-preserved and well-prepared with tissue that is adequately stained and readily interpretable.
 - The cellularity of a specimen is influenced by the intrinsic nature of the lesion, so quantity can be controversial if a single definition of adequate quantity is applied to all lesions.

J. Adequate FNA samples from a solid and cystic thyroid lesion: **Review**

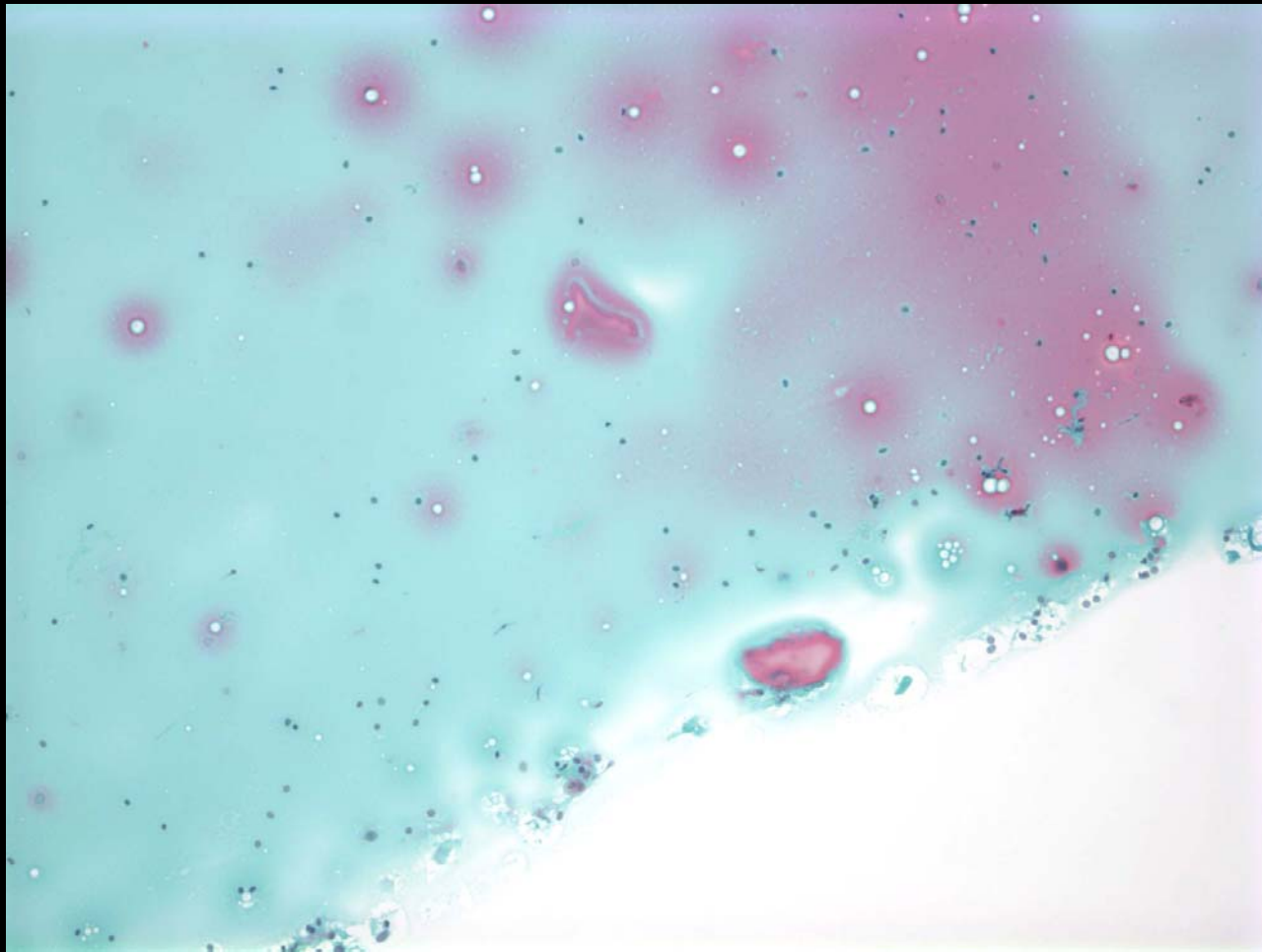
- *Solid Nodules....with cytological atypia*
 - *aspirates with sufficient cellular quality and quantity to be diagnostic of a particular malignancy will be interpreted as that entity*
 - *Scant specimens with any cytological atypia should never be interpreted as “unsatisfactory”, rather as “Satisfactory but limited by scant cellularity” with a description of the atypia.*
- *Solid Noduleswith inflammation*
 - *No set number of follicle cells has been established for adequacy in the setting of thyroiditis*
 - *Define limitations of the specimen, cytologic description or interpretation and recommend clinical correlation*

J. Adequate FNA samples from a solid and cystic thyroid lesion

■ *Solid Noduleswith abundant colloid*

- Aspiration of colloid nodules will produce variable amounts of follicle cells, frequently quite few.
- recognition of abundant colloid should override the requirement of a set number of follicular cells as the false negative rate of such an aspirate approaches zero.
- Cytological interpretation of adequacy can be reported as “limited” due to a scant or absent follicle cell component, but also reported as “negative” and “consistent with a colloid nodule”

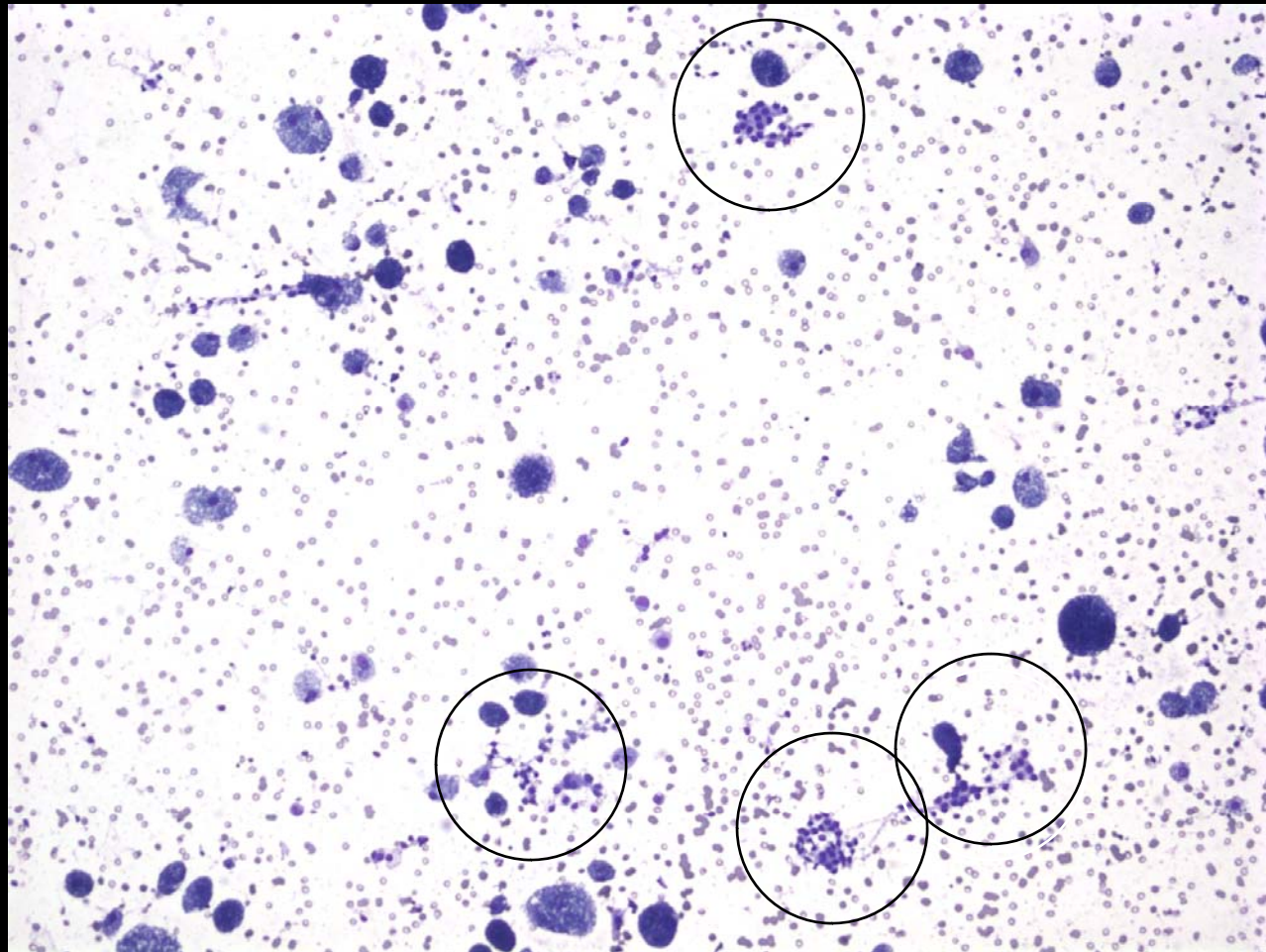
Colloid Nodule/cyst



J. Adequate FNA samples from a solid and cystic thyroid lesion

- *... follicular proliferation with less than abundant colloid*
 - *From the majority of these studies in which adequacy is clearly defined and the false negative rate determined, it seems that the minimum criteria for adequacy is 5-6 follicle groups each with at least 10 cells, but each case must be evaluated in the context of the clinical and radiological information available.*

Gray Zone of Cell Numbers....



J. Adequate FNA samples from a solid and cystic thyroid lesion: **Review**

■ Thyroid cysts

- Thyroid cysts are most commonly a result of cystic degeneration of an adenomatous nodule
- risk of malignancy in a thyroid cyst is low, 1- 4% in simple, non-complex cysts aspirates
- risk rises to 14% in mixed solid and cystic nodules, large cysts (>3cm) and recurring cysts
- Of aspirated cysts, only about 1% of cysts are malignant
- Given the extremely low potential of a false negative rate in such aspirates, to classify all thyroid cysts with few to no follicle cells “unsatisfactory” as some suggest does not seem to be in the best interest of patient care

J. Adequate FNA samples from a solid and cystic thyroid lesion: **Controversy**

- Interpretation of thyroid cysts
 - Unsatisfactory/nondiagnostic rather than negative for malignancy
 - Opponents
 - Negative interpretation maybe false negative, even if rarely
 - Clinical and radiological information not available to pathologist at sign out
 - Unsat/ND interpretation would ensure close clinical F/U in 4-6 months and repeat FNA if necessary

J. Adequate FNA samples from a solid and cystic thyroid lesion: **Controversy**

■ Interpretation of thyroid cysts

- Unsatisfactory/nondiagnostic rather than negative for malignancy
- Proponents
 - Unsat/ND interpretation forces clinician's hand to do more than may be clinically indicated
 - Clinical and radiological information is available to the clinician who is responsible for correlating cytology with radiological and clinical information
 - If clinician is not aware of potential for false negative result, then disclaimer should be sufficient to cover that issue

J. Adequate FNA samples from a solid and cystic thyroid lesion:

Conclusions

- 1. All thyroid FNAs must be technically adequate with well-preserved and well-prepared tissue for interpretation.
- 2. Any cytological atypia precludes the interpretation of inadequate and, although adequacy can be deemed “limited”, an interpretation of the atypia must be rendered.
- 3. An interpretation of an inflammatory process such as thyroiditis does not require a minimum number of follicle cells.
- 4. An interpretation of a colloid nodule in which there is abundant, thick colloid present on the slide(s) does not require a minimum number of follicle cells.
- 5. In solid nodules producing a follicular cell population with less than abundant colloid, a minimum number of 5-6 groups with a least 10 cells is recommended.

J. Adequate FNA samples from a solid and cystic thyroid lesion: **Conclusions**

- 6. Thyroid cysts with little to no follicular cells should be interpreted as negative for malignancy with the limited adequacy defined by the scant or absent follicular component, a recommendation for correlation with the cyst size and complexity and a disclaimer about the possibility of cystic papillary carcinoma (wording TBD).

J. Adequate FNA samples from a solid and cystic thyroid lesion

Discussion